

# **Weather and Radar Processor (WARP) Operational Capabilities Test (OCT) Report**

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## EXECUTIVE SUMMARY

This test report documents the results and events of the Weather and Radar Processor (WARP) Operational Capabilities Test (OCT) conducted on January 23 through 25, 1996, at the WARP offeror's (Harris Information Systems Division (HISD), Melbourne, FL) test facility. The objective of the WARP OCT was to provide an operational demonstration of a complete Stage 0 WARP system through the verification of WARP Stage 0 system requirements as per the WARP System Specification. The WARP OCT was witnessed and assessed by the Federal Aviation Administration (FAA) Technical Evaluation Team (TET), and was conducted by personnel from the offeror. The OCT called for 19 specific tests which were defined in the WARP OCT Test Plan, RFP DTFA01-95-R-41302, appendix L-1 and Procedures, RFP DTFA01-95-R-41302, appendix L-2. The tests were designed to use real-time weather data to verify system performance and functional capabilities. A majority of the system requirements were verified through offeror demonstration of functional capabilities and product analysis. The current operational Meteorologist Weather Processor (MWP) system was used to provide the ground truth for comparison of received and generated weather products obtained from the proposed WARP system.

The results of the tests successfully demonstrated 78 out of 81 Priority 1 requirements, 53 out of 59 Priority 2 requirements, and 84 out of 96 Priority 3 requirements. Since the results of the OCT did not verify all WARP Stage 0 requirements, a full Factory Acceptance Test (FAT) and Site Acceptance Test (SAT) are recommended for the Stage 0 system. In addition, a limited Operational Test and Evaluation (OT&E) should be conducted on the Stage 0 system.

## 1. INTRODUCTION.

### 1.1 PURPOSE.

An Operational Capability Test (OCT) was conducted as part of the technical evaluation of the offeror's proposal in response to the Weather and Radar Processor (WARP) Request for Proposal (RFP). The OCT was held at the offeror's (Harris Information Systems Division (HISD), Melbourne, FL) facility. The OCT was performed by offeror personnel and formally witnessed by Federal Aviation Administration (FAA) personnel. The OCT was utilized to assess the functional and performance capability of the proposed WARP system in meeting WARP Stage 0 system requirements.

### 1.2 SCOPE.

This OCT report presents the results of the OCT by identifying the pass/fail scoring of applicable Stage 0 WARP system requirements. The report also discusses significant events that were observed by FAA representatives during test conduct.

## 2. REFERENCE DOCUMENTS.

### 2.1 GOVERNMENT DOCUMENTS.

FAA-STD-024b	Content and Format Requirements for the Preparation of Test and Evaluation Documentation
FAA-E-2898	Weather and Radar Processor (WARP) System Specification
RFP DTFA01-95-R-41302, Appendix L-1	Weather and Radar Processor (WARP) Operational Capability Test Plan
RFP DTFA01-95-R-41302, Appendix L-2	Weather and Radar Processor (WARP) Operational Capability Test Procedures

## 3. SYSTEM DESCRIPTION.

### 3.1 MISSION REVIEW.

The WARP mission is to provide Air Traffic Control Specialists (ATCS) with accurate, reliable and timely weather information. The WARP will provide meteorologists with tools to analyze rapidly changing and potentially hazardous weather conditions. This information will be used to support air traffic control (ATC) in their primary mission of safely sequencing and separating aircraft. The operational needs to be addressed by WARP are:



- a. Continuous acquisition of all available real-time weather measurements pertaining to the area of interest;
- b. Acquisition of official weather observations, reports, and forecasts as available;
- c. Detection of potential weather hazards with prompt notification to the meteorologist;
- d. Graphic workstation display manipulation functions for rapid presentation and analysis of weather conditions; and
- e. Graphic and textual product generation and dissemination capabilities for communicating hazards to ATC users, including providing radar weather information for display on controller surveillance displays.

### 3.2 TEST SYSTEM CONFIGURATION.

The offeror's system presented at the OCT was the configuration which was presented in the technical proposal response to the WARP solicitation. The offeror's detailed OCT test procedures provided in the proposal response presented a description of the hardware and software elements for the system that was demonstrated at the OCT.

The system presented at the OCT was required to be configured as the Dallas/Fort Worth (ZFW) Air Route Traffic Control (ARTCC) WARP system. The system presented included all hardware and software requirements for:

- a. receipt and processing of live meteorological data from an offeror data source;
- b. supporting operations at the meteorologist workstation; and
- c. supporting operations at the briefing terminals.

## 4. TEST AND EVALUATION DESCRIPTION.

### 4.1 TEST SCHEDULE AND LOCATION.

The WARP OCT was held at the offeror's site. It was conducted over 3 days from January 23 through 25, 1996. The OCT consisted of 19 specific tests. The tests were conducted in the following order: (1) the test that validated the hardware configuration (Test 19); (2) tests that validated Priority 1 requirements (Tests 1, 2, 4, 14, and 17); and (3) tests that validated Priority 2 and Priority 3 requirements (all other tests).

### 4.2 TEST PARTICIPANTS.

The WARP OCT was witnessed and assessed by the FAA Technical Evaluation Team (TET), and was conducted by the Test Operations Team (TOT) made up of personnel from the offeror. Specific duties of test participants are described in the OCT Test Plan.

#### 4.3 TEST AND SPECIALIZED EQUIPMENT.

No specialized test equipment was needed during the OCT conduct.

#### 4.4 TEST OBJECTIVES/CRITERIA.

The test objectives of the WARP OCT were to provide an operational demonstration of a complete WARP Stage 0 system through the verification of WARP Stage 0 system requirements as documented by the System Specification. The tests were designed to use real-time weather data to verify system performance and functional capabilities.

#### 4.5 TEST DESCRIPTIONS.

The WARP OCT was comprised of 19 formal tests. Each test was comprised of one or more test procedures which were designed to run independently of each other. The tests were designed to validate to what level the offeror's proposed system satisfied the WARP Stage 0 system requirements. The following tests were run during the OCT:

- a. Processing and display of radar data (Test 1);
- b. Processing and display of satellite data (Test 2);
- c. Processing and display of lightning data (Test 3);
- d. Processing and display of received alphanumeric products (Test 4);
- e. Processing and display of National Weather Service (NWS) Graphic Products (Test 5);
- f. Processing and display of Watch/Warning/Advisory Products (Test 6);
- g. Processing and display of Station Model Plot (SMP) Products (Test 7);
- h. Processing and display of Thermodynamic Products (Test 8);
- i. Processing and display of Contour Analysis Products (Test 9);
- j. Processing and display of Streamline Analysis Products (Test 10);
- k. Processing and display of Vertical Cross-Section Analysis Products (Test 11);
- l. Processing and display of Alarm/Alerts (Test 12);
- m. Monitoring and Control Capabilities (Test 13);
- n. Computer-Human Interface (CHI) Capabilities (Test 14);
- o. Product Retention Capabilities (Test 15);
- p. Product Archiving Capabilities (Test 16);
- q. Performance (Test 17);
- r. System Adaptation Capabilities (Test 18);
- s. System Characteristics (Test 19).

A detailed description of each OCT test is provided in the FAA OCT Test Plan, RFP DTFA01-95-R-41302, appendix L-1, and OCT Generic Test Procedures, RFP DTFA01-95-R-41302, appendix L-2, documents.

#### 4.6 DATA COLLECTION AND ANALYSIS METHOD.

The current operational Meteorologist Weather Processor (MWP) system was used to provide the ground truth for comparison of received and generated weather products obtained from the proposed WARP system. The MWP products were collected by the FAA OCT Data Collection Team at the operational site (ZFW). Additionally, received product logs were collected from the OCT system and were compared with the received product logs from the MWP to verify system product and data acquisition. The logs and data were analyzed to verify project and system specification requirements. All other requirements were verified through demonstrations of system capabilities.

#### 5. TEST RESULTS AND DISCUSSION.

This section summarizes the results of the OCT conduct both in terms of observed test events and off-line product analysis. Appendix A provides a detailed list of the OCT scoring results for each applicable requirement.

##### 5.1 TEST 1 - RADAR PRODUCTS.

The radar product test was used to verify the proposed WARP system was capable of obtaining and displaying the following types of radar products: (1) Next Generation Weather Radar (NEXRAD) Information Dissemination Service (NIDS) radar products obtained from individual radar sites, (2) regional mosaic products, (3) point mosaic products, and (4) national mosaic products.

##### 5.1.1 Test Observations.

The NIDS products requested by the FAA for routine acquisition were entered in the OCT Detailed Procedures log book. Regional mosaics centered about ZFW were generated and displayed and printed for off-line analysis. Point mosaic products and National Mosaic Products were displayed and printed for off-line analysis. The following items were observed during the test:

- a. FAA requested the Echo Tops (TP) products from Dyess, TX (DYX) but did not receive any products. The OCT data collection team at a field site confirmed that no TP products were received from DYX during the test conduct period.
- b. The Velocity Azimuth Display (VAD) winds products from Shreveport, LA (SHV) did not contain wind barbs. The VAD products obtained on the MWP from the SHV site for the same time period also did not contain wind barbs.
- c. The FAA observed that the size of the regional mosaic products were 2560 kilometer (km) by 2160 km which exceeded the OCT test requirement of 2000 km by 1500 km.

### 5.1.2 Product Analysis.

Several color hard copies of radar products were generated so that a comparison could be made with hard copies of radar products obtained by the FAA at an operational site. Table 1 identifies those products that went through the comparative analysis.

TABLE 1. RADAR PRODUCTS

Offeror		FAA Source	
Product	Times	Product	Times
NIDS Products			
FWS VAD	14:49	FWS VAD	14:44, 14:50
FWS CR	14:14	FWS CR	--
FWS B1	15:06	FWS B1	15:02, 15:07
LZK B1	15:14	LZK B1	15:13
LZK V1	14:45	LZK V1	--
SHV CR	14:46, 15:03	SHV CR	15:04
TLX TP	14:46	TLX TP	14:46
Regional Mosaic Products			
Times		Times	
15:11, 15:25, 15:43, 15:52		15:10, 15:15, 15:25, 15:40, 15:45,15:50, 15:55	
National Mosaic Products			
15:34, 15:38		15:35, 15:40, 15:45	

The following conclusions were derived from the analysis:

a. Weather information provided by the offeror was consistent with the product information obtained by the FAA.

b. NIDS products obtained by the offeror were extremely consistent with the FAA collected products. Areas compared included location, shape, intensity of significant weather phenomena, and a verification that the NIDS products were not altered by the offeror's NIDS vendor.

c. It was observed during product analysis that product times for NIDS products provided by the offeror did not exactly agree with the product times for NIDS products obtained by the FAA. This discrepancy occurred because two official product times are assigned to each NIDS product. The offeror's NIDS vendor for WARP (Unisys) displays "Product Generation Times"

instead of "Volume Scan Times," which is the convention used by the FAA collection source NIDS vendor (WSI Corporation).

d. Comparison of radar mosaics between the offeror's products and products obtained by the FAA showed some differences, but generally were very consistent. Some observable differences were expected to occur because the regional mosaics between the two systems are created from different NEXRAD products. The FAA data collection system uses base reflectivity products to generate mosaic products. The WARP system requires composite reflectivity products for mosaic product generation.

e. The mosaic products obtained from the offeror's NIDS vendor did not contain a color-intensity legend. The lack of color mapping significantly hampered product comparison analysis although it was not required by the System Specification.

f. Information contained in the point product mosaics agreed with information contained in the vendor provided Storm Attribute Table.

g. All products provided by the demonstration system satisfied product display requirements. After data analysis was completed, the FAA TET determined the offeror passed all Test 1 requirements.

## 5.2 TEST 2 - SATELLITE PRODUCTS.

The satellite product test was used to verify the proposed WARP system was capable of obtaining, processing and displaying live GOES 8 satellite data. The test was also used to verify the offeror's capability of creating, storing, and modifying the display of satellite products with the use of enhancement curves.

### 5.2.1 Test Observations.

The following items were observed during the test conduct:

a. During the test conduct, the size of the offeror's Intermediate Area (IA) coverage was 1600 km by 1600 km. This did not meet the OCT Test requirement of 2000 km by 2000 km as documented in the OCT Test Plan. Therefore, the offeror failed requirement 3.2.1.1.2.1.1.2.1, Areas of Coverage. Offeror technical personnel stated that the IA coverage requirement could easily be met.

b. During automatic product update for an IA visible (VIS) satellite product (step 6, OA 3), it was noted that a product was not received at the expected time of 18:30. The team collecting comparison data at an FAA site also did not receive the IA VIS product at 18:30.

### 5.2.2 Product Analysis.

Several color hard copies of satellite products were generated so that a comparison could be made with hard copies of satellite products obtained by the FAA at an operational site. Table 2 identifies those products that were used for comparative analysis.

TABLE 2. SATELLITE PRODUCTS

Offeror		FAA Source	
Product	Times	Product	Times
NA VIS	17:45	NA VIS	17:45
NA IR2	17:45	NA IR2	17:45
IA VIS	18:15	IA VIS	18:15
IA IR2	18:15	IA IR2	18:15

The following conclusions were derived from the analysis:

- a. Weather information provided by tested system is consistent with weather information provided by the products independently obtained by the FAA.
- b. All products provided by the demonstration system satisfied product display requirements. The FAA TET determined the remaining assigned specification requirements for Test 2 passed after they performed data analysis on the test results.

### 5.3 TEST 3 - LIGHTNING PRODUCTS.

The lightning products test was used to verify the proposed WARP system was capable of obtaining, processing, and displaying live lightning data obtained by the National Lightning Detection Network (NLDN).

#### 5.3.1 Test Observations.

No adverse events were noted during test conduct.

#### 5.3.2 Product Analysis.

Several color hard copies of lightning products were generated. Each product presented lightning data for a specified time interval. Different colors depicted the history of lightning events. A plus (+) symbol and a minus (-) were used to depict strike polarity. The FAA was unable to obtain lightning products at the time of test conduct and therefore, a comparison analysis of the offeror's products against a baseline set could not be performed. However, the lightning products were compared with obtained satellite images for the same time period. The

analysis showed that the location of most recent lightning strikes were consistent with the locations of clouds associated with a strong cold front. Further analysis showed that the lightning products met all product display requirements. The lightning products did not have a product legend that maps specific colors to specific stroke ages. This is not required by the System Specification but inclusion of an age legend would make the products more operationally useful. After data analysis, the FAA TET determined the offeror passed all specification requirements for Test 3.

#### 5.4 TEST 4 - ALPHANUMERIC PRODUCTS.

The Alphanumeric Products test was used to verify the proposed WARP system was capable of obtaining, processing, and displaying live alphanumeric products.

##### 5.4.1 Test Observations.

The alphanumeric products requested by the FAA for product display were entered in the OCT Detailed Procedures log book. Each product was displayed and printed for off-line analysis and compared with FAA obtained data. The following items were observed during the test conduct:

- a. During product display of requested alphanumeric products, the system experienced several soft resets which appeared to be associated with displaying a new requested product in the product append mode.

##### 5.4.2 Product Analysis.

Alphanumeric products were compared with the products obtained by the FAA for the same date and time. The results of the product comparison analysis are provided below in table 3. An explanation is provided for those products that failed the comparison analysis.

Due to the failure of several alphanumeric product displays, the offeror failed specification requirement 3.2.1.1.2.1.2.1, Display Products which was determined during product analysis. The offeror passed all other assigned requirements for Test 4.

TABLE 3. ALPHANUMERIC PRODUCTS

Requested Product	Pass/Fail	Comment
FA4W	P	
WA4 S	P	
WSTMKCC	P	
PIRTX	P	
FWCACT FWCDAL	P P	
FRHDFW	P	
FA5SLC	P	
FTADFW FTADAL	P P	
SWOMKC	F	Product was not correctly printed by WARP Demonstration system. It appears that the database was corrupted.
ZFPTX	F	Data obtained from the WARP Demonstration system was 2 days old and not for the current date of 1/23.
FD0DAL FD1DAL FD2DAL FD3DAL	P P P P	
CWAZFW	P	
AWWMKC	P	No data was current at time of product request. The FAA was also unable to obtain an AWW at this same time.
PMDSPD	F	A printout obtained from the WARP demonstration system contained a collective of separate prognostic discussions. The WARP did not correctly print all discussions. The Tropical Desk discussion (message # 754) was not displayed in its entirety. Following this message, erroneous state weather summary is printed. In addition, message #764 did not get printed correctly; it is mixed with state weather roundup data.
ADM	F	The FAA obtained two public information messages (PNSWSH) on 1/23 (message # 749, 753). A printout from WARP contained message #753 only. In addition, message #753 was not printed out in its entirety. WARP also printed message #755 which is incorrect since this appears to be a Zone Forecast.



## 5.5 TEST 5 - NATIONAL WEATHER SERVICE GRAPHIC PRODUCTS.

The National Weather Service (NWS) Graphic Products test was used to verify the proposed WARP system was capable of obtaining, processing, and displaying current graphic analysis products provided by the NWS.

### 5.5.1 Test Observations.

The NWS graphic products that were requested by the FAA for product display were entered in the OCT Detailed Procedures log book. Each product was displayed and printed for off-line analysis and compared with FAA obtained data. The following items were observed during the test conduct:

- a. The print queue process halted when printing displayed graphic analysis products. It was discovered that a large core dump data file (12 megabytes (MB)) with a date of October 95 was in the TEMP directory. Once this file was removed, the print queue experienced no further problems.

### 5.5.2 Product Analysis.

NWS graphic products were compared with the products obtained by the FAA for the same date and time. The results of the product comparison analysis are provided below in table 4. All products, as shown below, passed the comparison analysis since each product was exactly consistent with the corresponding product obtained by the FAA. After data analysis, the FAA TET determined the offeror passed all Test 5 requirements.

TABLE 4. NWS GRAPHIC PRODUCTS

Requested Graphic Product	Pass/Fail
NMCGPH024	P
NMCGPH546	P
NMCGPH02I	P
NMCGPH50H	P
NMCGPH52V	P
NMCGPH74V	P
NMCGPHL3M	P
NMCGPH24Y	P
NMCGPHI2D	P
NMCGPH90R	P
NMCGPH5GV	P
NMCGPH90W	P
NMCGPHPOX	P
NMCGPH94Q	P
NMCGPH90I	P
NMCGPH90S	P

#### 5.6 TEST 6 - WATCH/WARNING/ADVISORY PRODUCTS.

The purpose of the Watch/Warning/Advisory Products test was to verify the capability of the proposed WARP system to acquire and process Watch, Warning, and Advisory products and to verify the capability of the system to graphically depict the coverage areas associated with these products on a map background.

##### 5.6.1 Test Observations.

The offeror elected not to run the test during the OCT. They stated in their technical proposal that additional developmental work is necessary.

#### 5.6.2 Product Analysis.

As shown in appendix A, the offeror failed all assigned requirements to Test 6 since the offeror decided not to perform the test.

#### 5.7 TEST 7 - PLOT PRODUCTS.

The Plot Product Test was used to verify the proposed WARP system was capable of obtaining and processing surface and upper-air observational data and use this decoded information to create Station Model Plots (SMP) for both surface and specified upper-air pressure levels.

##### 5.7.1 Test Observations.

The SMP products that were requested by the FAA for product display were entered in the OCT Detailed Procedures log book. Each product was displayed and printed for off-line analysis and compared with FAA obtained data. No apparent variances were noticed during test conduct.

##### 5.7.2 Product Analysis.

Hard copies of SMP graphic products were compared with the products obtained by the FAA for the same date and time. The results of the product comparison analysis are as follows:

- a. The surface-based plots from the offeror agreed with products obtained by the FAA.
- b. The upper-air plots were not correctly generated during the OCT. After reviewing the test procedures, (Test 7, step 2), the test procedure incorrectly called for the display of an upper air plot for the surface.

#### 5.8 TEST 8 - THERMODYNAMIC PRODUCTS.

The Thermodynamic Product Test was used to verify the proposed WARP system was capable of processing surface and upper-air observational forecast model data to create thermodynamic analysis diagrams and associated sounding analysis parameters.

##### 5.8.1 Test Observations.

Thermodynamic products were created for those reporting stations identified by the FAA. Location information of these stations were entered in the OCT Detailed Procedures log book. Each product was displayed and printed for off-line analysis and compared with FAA obtained data. The following items were observed during the test conduct:

- a. The test steps associated with the creation of thermodynamic products based upon observational data were executed with no apparent problems.

b. The offeror elected not to perform test step 3 which called for the display of thermodynamic products associated with model forecast data. The offeror's technical proposal stated that additional product development is needed.

#### 5.8.2 Product Analysis.

Hard copies of thermodynamic products were compared with the products obtained by the FAA for the same date and time. The results of the product comparison analysis are as follows:

a. A comparison was made between the offeror's sounding analysis and the FAA obtained analysis for the 00:00 UTC 25 JAN upper-air sounding from Miami, Florida. For each analysis, a graphical depiction of the sounding was provided on a Skew T Log P diagram as well as associated sounding index parameters. In comparing the product hard copies, the graphical plots of temperature and dew point were correctly displayed on the Skew T Log P diagram provided by the offeror. The offeror's hard copy of the product provided two sets of calculated index parameters which did not agree with each other. The set of index parameters obtained by the FAA did agree with one set provided by the offeror.

b. On the offeror's proposed system, the three-letter location ID for the Miami upper air station was MIA. On the operational MWP on which the FAA was obtaining comparison data, the three-letter location ID for the upper air station was MFL. A check with the NWS confirms that the correct location ID for this upper air station is MFL.

c. The specification requires that geopotential height values should be provided for all standard pressure levels provided in the diagram. The offeror's products did provide these values in all of their diagrams. However, the accuracy of the values is questionable.

#### 5.9 TEST 9 - CONTOUR ANALYSIS PRODUCTS.

The Contour Analysis Product Test was used to verify the proposed WARP system was capable of processing surface and upper-air observational data and forecast model data to create contour analyses.

##### 5.9.1 Test Observations.

The analysis products that were requested by the FAA for product display were entered in the OCT Detailed Procedures log book. Each product was displayed and printed for off-line analysis and compared with FAA obtained data. While generating print outputs of the displayed products during the test conduct, the "Disk Full" status indicator became active. At the same time, the print queue process failed to operate. This was the second occurrence during the OCT in which the print queue failed due to lack of disk space. Further analysis showed some temporary system files were not being deleted properly by the UNIX operating system.

### 5.9.2 Product Analysis.

Hard copies of contour analysis products were compared with the products obtained by the FAA for the same date and time. The results of the product comparison analysis are as follows:

- a. A majority of the displayed product hard copies from the proposed system lacked adequate contour labeling. This condition happens when the product is displayed and printed for an area smaller than the North American (NA) scale.
- b. There were a few cases of contour lines crossing.
- c. Surface analysis products obtained from the proposed WARP system agree with those from the MWP. Only minor variations were noted.
- d. Upper air analysis obtained from the proposed WARP system agree with those from the MWP. However, on several analyses, contour lines were consistently placed on the wrong side of observed data points. It is not clear if this condition is caused by the Barnes analysis process, or if the analysis grid is slightly out of alignment with respect to station locations.

### 5.10 TEST 10 - STREAMLINE ANALYSIS PRODUCTS.

The Streamline Analysis Product Test was used to verify the proposed WARP system was capable of processing surface and upper-air observational data and forecast model data to create streamline analyses.

#### 5.10.1 Test Observations.

The analysis products that were requested by the FAA for product display were entered in the OCT Detailed Procedures log book. Each product was displayed and printed for off-line analysis and compared with FAA obtained data. The following items were observed during the test conduct:

- a. During the printing process of displayed products, a printout of several nonrequested Barnes surface analysis products and corresponding plots were obtained from the color printer. This was caused by an automatic update request of the Barnes products during the test conduct. Since auto update was selected and the product printed, all updates were printed until auto update was deselected.
- b. For Step 3, OA 1, a member of the FAA TET observed that no height value was provided for the requested displayed product as indicated by the test procedure. On later evaluation by the TET, it was determined that the proposed system correctly displayed the level in pressure units only since the TET requested a product for a specified pressure level and not a height level.

### 5.10.2 Product Analysis.

Hard copies of streamline analysis products were compared with the products obtained by the FAA on the MWP for the same date and time. The results of the product comparison analysis are as follows:

- a. The streamline analysis products for the surface, upper air, and model data obtained from the proposed WARP system agrees with those from the MWP.
- b. The product legend provided for forecast model streamline analyses are not clear because no information is provided in the label that the data is a forecast from a particular model set.

### 5.11 TEST 11 - VERTICAL CROSS-SECTION ANALYSIS PRODUCTS.

The Vertical Cross-section Analysis Product Test was used to verify the proposed WARP system was capable of processing surface and upper-air observational data and forecast model data to create cross-section analysis products.

#### 5.11.1 Test Observations.

The analysis products that were requested by the FAA for product display were entered in the OCT Detailed Procedures log book. Each product was displayed and printed for off-line analysis and compared with FAA obtained data. The following items were observed during the test conduct:

- a. The offeror elected not to perform test step 2 which called for the display of cross-section analysis products based on model forecast data. The offeror's technical proposal stated that additional product development is needed.
- b. During the printing process of displayed products, a printout of several nonrequested Barnes surface analysis products and corresponding plots were obtained from the color printer. Refer to paragraph 5.10.1, item (1), for an explanation.

#### 5.11.2 Product Analysis.

Hard copies of cross-section analysis products were compared with the products obtained by the FAA for the same date and time. The results of the product comparison analysis are provided below:

- a. Vertical cross-section analysis products obtained from the proposed WARP system agreed with those from the MWP.

The following item was noted:

a. The Pressure indicator label on the left side of each product display should use tick marks to indicate the exact location of provided pressure levels on the label. The height indicator label on the right side of the diagram should also have tick marks to depict exact locations on the label.

#### 5.12 TEST 12 - ALARM/ALERT FUNCTIONAL CAPABILITIES.

The Alarm/Alert Functional Capabilities Test was used to verify the capability of the proposed WARP system to generate an alarm/alert upon receipt of a product tagged for such notification. This test was also used to verify the system capability to monitor incoming weather data and initiate an alarm/alert when user-specified weather conditions exist.

##### 5.12.1 Test Observations.

The proposed system was configured for audible and visual alarm interrupts. The system was additionally configured for product arrival alarm/alert processing. Finally, the system was configured to initiate alarm/alerts when specified weather criteria was detected in surface observation reports. The following items were observed during the test conduct:

a. Product arrival alarm/alerts were successfully demonstrated for the specified products. Each product identified for product arrival alarm/alert was entered in the OCT procedures log book. Of the products identified, the National Meteorological Center (NMC) graphic product NMCGPH00I did not initiate a product alarm/alert. After reviewing the product receipt log, it was discovered that the product was not received by the system during the scheduled test period. The FAA, however, did receive the NMCGPH00I product at an operational site during the test conduct period. The product retrieval alarm/alert test step was repeated so that an alarm would be triggered for product NMCGPH90I. When the product was received by the system, the alarm was successfully triggered.

b. Weather alarm criteria was successfully demonstrated for surface observations from specified reporting locations. Alarm criteria and station locations were entered in the OCT procedures log book.

##### 5.12.2 Product Analysis.

The printed alarm/alert messages agreed with the reported test observation.

#### 5.13 TEST 13 - MONITORING AND CONTROL FUNCTIONAL CAPABILITIES.

The Monitoring and Control Functional Capabilities Test was used to verify that the proposed system was capable of detecting and reporting system failures and to determine if the system provided a user-friendly and secure approach to system operations.

#### 5.13.1 Test Observations.

The following items were observed during the test conduct:

- a. The system was capable of being powered down and restarted. Once it was restarted, the system was receiving and processing data and products.
- b. The demonstrated system failed to trigger an alarm/alert when a briefing terminal was disconnected from the system. Therefore, the offeror failed requirement 3.2.1.1.2.1.3. Without authorization from the FAA, the offeror made modifications to a pointer directory which corrected this error.
- c. The system was not capable of restoring a product that was archived. Requirement 3.2.1.1.5.2.4 was not successfully verified.

#### 5.13.2 Product Analysis.

Analysis of product displays obtained and printed after system restart confirmed that the system was processing live and current data.

### 5.14 TEST 14 - COMPUTER- HUMAN INTERFACE FUNCTIONAL CAPABILITIES.

The Computer-Human Interface (CHI) Functional Capabilities Test was used to verify that the proposed system met the functional CHI requirements of the WARP System Specification. The CHI of both the meteorologist workstation and the briefing terminal were evaluated.

#### 5.14.1 Test Observations.

The majority of requested CHI operations were successfully demonstrated during the test conduct. Several of the test steps failed to meet specification requirements. Details of these failures are discussed below:

- a. It took more than five separate mouse clicks to have the user add a product to an animation sequence in test step 24. This did not meet the system requirement 3.3.7.2 which requires a maximum limit of five user interactions per product display or system function.
- b. It took seven separate mouse clicks to have the user to remove a selected product from an animation sequence. This did not meet the system requirement 3.3.7.2.
- c. Test step 3, OA 1 of Meteorological Interactions was not performed since neither the offeror nor the FAA were able to obtain a current graphical depiction of an advisory product. (The proposed system lacked the capability to obtain these graphical depictions of Watch/Warning/Advisory Products. See discussion for Test 6.)



#### 5.14.2 Product Analysis.

Analysis of product hard copies confirmed that the system was processing live and current data.

#### 5.15 TEST 15 - RETENTION CAPABILITIES.

The Retention Capabilities Test was used to verify the capability of the proposed system to meet product and data mass storage requirements of the WARP System Specification.

##### 5.15.1 Test Observations.

Product retention logs were displayed for radar products, satellite products, lightning products, alphanumeric products, NWS graphic products, and Gridded Binary Data products. From each retention log, a product was selected by the TET and was displayed on the system. During the printing of the retention logs, the print queue was malfunctioning due to a lack of system disk space.

##### 5.15.2 Product Analysis.

The following abnormalities were discovered reviewing the product retention logs:

- a. Several alphanumeric products had incorrect product receipt dates, since they were time stamped with future dates.
- b. Several alphanumeric products that were received several months prior to the test were still retained in the database. In other cases, the retention log showed that the system did not have the required minimum stored products. Further analysis indicated that these conditions were associated with products that are issued on a nonscheduled basis.

#### 5.16 TEST 16 - ARCHIVING CAPABILITIES.

The Archiving Capabilities Test was used to verify the capability of the proposed system to store 15 days of required archive products and to verify the capability to restore, display, and print products obtained from the archive device.

##### 5.16.1 Test Observations.

The following discrepancies were observed during test conduct:

- a. The proposed system only archived products which were manually created or modified by the user. No automatically generated products that were created locally by the system on a scheduled basis were archived as required by requirement 3.2.1.1.4.3.1.2. The offeror interpreted the requirement that only manually modified or created products need to be archived.

b. Requested archived products could not be selected from the tape archive device because the file directory on the archive did not match the archive file directory contained on the hard disk.

#### 5.16.2 Product Analysis.

No off-line product analysis was performed.

### 5.17 TEST 17 - PERFORMANCE.

The Performance Test was used to determine the product display performance characteristics of the proposed system and to determine if these performance measurements met or exceed system specification requirements.

#### 5.17.1 Test Observations.

Before timing measurements were taken, the system was placed under operational load conditions by starting an animation sequence on the meteorological workstation and starting a product sequence on all 15 briefing terminals. Then timing measurements were entered into the OCT test procedure log book for several product generation and display functions. For each performance category, 50 timing measurements were obtained using a stop watch, starting the clock when the request was made via a selection by the user at the workstation and terminating the clock when the product was completely displayed. From each set of 50 measurements, the following times were calculated: average time, maximum time, and the 99.5 percentile time. No unusual events were observed during test conduct.

#### 5.17.2 Data Analysis.

Timing measurements were taken by two TET members and recorded in separate OCT test procedure log books. For each performance operation, the timing results of each TET member were averaged to create a separate set of 50 timing measurements. From these measurements, timing statistics were calculated. The performance results are presented below in table 5.

The performance statistics calculated for each performance area far exceeds the performance requirements provided in table 30-2 and table 30-3 of the WARP System Specification for product generation and product display, respectively.

TABLE 5. OFFEROR SYSTEM PERFORMANCE STATISTICS

Performance Area	Offeror			Specification		
	Avg. Time (sec)	99.5 % (sec)	Max Time (sec)	Avg. Time (sec)	99.5 % (sec)	99.95 % (sec)
Surface Station Model Plot Generation and Display	0.58	1.24	1.61	8	23	30
Upper Air Station Model Plot Generation and Display	1.9	2.31	2.53	8	23	30
National Radar Product Display	0.54	0.76	0.8	3	8	10
Alphanumeric Product Display	0.79	1.53	1.94	3	8	10
NWS Graphic/Gridded Product Display	0.73	0.87	0.95	3	8	10
Lightning Product Display	0.69	0.84	0.92	3	8	10
Thermodynamic Product Display	1.62	2.5	2.99	3	8	10
Satellite Product Display	0.58	1.35	1.78	3	8	10
Vertical Cross Section Display	1.18	2.48	3.2	3	8	10
Horizontal Analysis Product Display	0.62	0.93	1.09	3	8	10

#### 5.18 TEST 18 - ADAPTIVE OPERATION CAPABILITIES.

The Adaptive Operation Capabilities Test was used to verify the capability of the proposed system to set and modify a select set of user adaptation parameters.

##### 5.18.1 Test Observations.

Actions were performed to determine if the proposed system reacted correctly to changes to system adaptation. For purposes of this test, a change was made to the default contour interval for horizontal objective analysis of temperature. Once the change was made to adaptation, the request was made to display a temperature analysis without specifying a contour interval. The proposed system correctly displayed a temperature analysis in which the contours had an interval separation matching the value that was placed in adaptation.

##### 5.18.2 Product Analysis.

Analysis of product printouts indicated that the analyses were created correctly with the proper contour interval as specified by the system adaptation.

## 5.19 TEST 19 - SYSTEM CHARACTERISTICS.

The System Characteristics Test was used to determine if the configuration of the demonstrated system was in compliance with the system characteristics requirements as specified in the WARP System Specification.

### 5.19.1 Test Observations.

At the OCT in-brief, the offeror provided technical and product information of the OCT system configuration to the TET. After reviewing these documents, it was discovered that the Operational Humidity specification (20-80 percent RH) for the proposed display monitors of the meteorologist workstation did not meet WARP System Specification requirements (10-80 percent RH). No other items of specification noncompliance were discovered.

### 5.19.2 Product Analysis.

No product analysis was required for this test.

## 6. CONCLUSIONS.

The Weather and Radar Processor (WARP) Operational Capabilities Test (OCT) was held at the offeror's site and was conducted over 3 days from January 23 through 25, 1996. The WARP OCT was witnessed and assessed by the Federal Aviation Administration (FAA) Technical Evaluation Team (TET), and was conducted by the Test Operations Team (TOT) made up of personnel from the offeror. The objective of the WARP OCT was to provide an operational demonstration of a complete WARP system using real-time weather data.

The conclusions drawn from the OCT for the offeror are provided below:

a. The offeror successfully demonstrated 78 out of 81 Priority 1 requirements. The offeror failed no Priority 1 requirements for Radar (Test 1), and Performance (Test 17). The offeror's proposed system significantly exceeded the System Specification requirements for product generation and display. A summary of Priority 1 failures are as follows:

1. Test 2 - Satellite Products, requirement 3.2.1.1.2.1.1.2.1. The OCT Plan called for a satellite coverage area of 2000 km by 2000 km for the Intermediate Area (IA). The offeror was not aware of this requirement.

2. Test 4 - Alphanumeric Products, requirement 3.2.1.1.2.1.1.2.1. The offeror did not adequately demonstrate the display of alphanumeric products. Four out of 20 requested products failed analysis due to discrepancies between the products obtained by the offeror and those obtained by the FAA for the same date and time.

3. Test 14 - Computer-Human Interface, requirement 3.3.7.2. The offeror exceeded the limit of five user interactions per product display or system function request on at least two occasions.

b. The offeror successfully demonstrated 53 out of 59 Priority 2 requirements. A summary of Priority 2 failures are as follows:

1. Test 9 - Contour Analysis Products, requirement 3.2.1.1.2.1.3.7.5(a). It was determined during data analysis that a majority of the contours on the printed hard copies were not adequately labeled.

2. Test 15 - Retention, requirement 3.2.1.1.4.2. During data analysis of the product retention log for alphanumeric products, it was discovered that several of the products were time stamped with future dates.

3. Test 16 - Archiving. The offeror failed requirement 3.2.1.1.4.3.2 because requested archive products could not be recovered from the archive device. The offeror also failed requirement 3.2.1.1.4.3.1.2 because products generated by the system on a routine scheduled basis were not archived automatically.

4. Test 19 - System Characteristics. Requirements 3.2.4.2.1 and 3.2.4.2.1.1 were not adequately verified since technical documentation from the manufacturer indicated that the workstation display monitors failed to meet the humidity range requirements of the System Specification.

c. The offeror successfully demonstrated 84 out of 96 Priority 3 requirements. A summary of Priority 3 failures are as follows:

1. Test 6 - Watch, Warning, Advisory Products, requirements 3.2.1.1.2.1.3.3, 3.2.1.1.2.1.3.3.1, and 3.2.1.1.2.1.3.3.2(a,c,d,f). The offeror elected not to perform this test.

2. Test 8 - Thermodynamic Products, requirement 3.2.1.1.2.1.3.5. The offeror elected not to perform portions of the test which called for the display of products based on gridded model data.

3. Test 11 - Vertical Cross Section Products, requirements 3.2.1.1.1.5, 3.2.1.1.1.5.1, and 3.2.1.1.2.1.3.9.1. The offeror elected not to perform portions of the test which called for the display of products based on gridded model data.

4. Test 13 - Monitoring and Control. Requirement 3.2.1.1.3.1.3 was not adequately demonstrated since the proposed system failed to issue an alarm/alert when a briefing terminal was disconnected. Requirement 3.2.1.1.5.2.4(b) was not adequately verified due to failure of the system archive capability.

## 7. RECOMMENDATIONS.

Based on the results of the Operational Capabilities Test (OCT) the following issues must be addressed as indicated:

a. All Functional Areas: An extensive, Factory Acceptance Test (FAT) and Site Acceptance Test (SAT) should be conducted prior to deployment of the Stage 0 implementation to: (1) to reverify those Stage 0 requirements that were successfully demonstrated at the OCT, (2) to verify those Stage 0 requirements that were not successfully demonstrated at the OCT, and (3) to verify those Stage 0 requirements that were not tested during the OCT.

b. Alphanumeric and National Weather Service (NWS) Graphic Products: The offeror indicated at the OCT in-brief that the list of alphanumeric and graphic products identified in tables A-2 and A-7, respectively, of the Weather and Radar Processor (WARP) System Specification are out of date and some of the products are no longer available from commercial sources. As the NWS continues with their modernization efforts, it is likely more products from the acquisition list contained in tables A-2 and A-7 will be out of date. The offeror must ensure the WARP system is kept up-to-date with respect to product/data acquisition. Additionally, the WARP should be designed to accept changes to existing product acquisition without major changes to system or software design.

c. Product Legends: The Federal Aviation Administration (FAA) and the offeror should work together to improve the quality of supplied product legends. In many instances during product analysis, it was difficult to perform an objective analysis on certain products because vital information about the products was missing. It is recommended that all displayed products provide legends that display intensity levels, data history, level, types, and data source. Improved legends are particularly needed for radar mosaic products, lightning products, and satellite products.

d. Skew T Log P Diagrams: The presentation of the Skew T Log P diagram could be improved. The presentation of the height indicator is confusing and height values that are assigned to pressure levels appear to be incorrect. The WARP should be able to graphically plot only one station. Current implementation requires the plotting of data from two stations.

e. Contour Analysis Products: A more detailed review of contour analysis should be conducted at FAT. Review of offeror provided analysis products indicated that the alignment of the analysis with respect to station locations may be incorrect. There were numerous instances in which contour lines were placed on the wrong side of reported station locations.

f. Retention: Due to time limitations of the OCT, a comprehensive analysis of the product database could not be accomplished. A detailed analysis needs to be conducted at FAT to ensure that the WARP has the system resources to maintain products and data as required by the System Specification.

g. Archiving: The offeror's proposed system could not demonstrate adequately any of the requested archive functions during OCT. The offeror's development and testing of this capability should be monitored closely.

h. Computer-Human Interface (CHI): The offeror must work closely with the FAA to ensure that requested user actions via the CHI take no more than five user selections or mouse clicks.

## 8. ACRONYMS AND ABBREVIATIONS.

ARTCC	Air Route Traffic Control Center
ATC	Air Traffic Control
ATCS	Air Traffic Control Specialists
CHI	Computer-Human Interface
DYX	Dyess, TX
FAA	Federal Aviation Administration
FAT	Factory Acceptance Test
HISD	Harris Information System Division
IA	Intermediate Area
MIA	Miami, FL
MFL	Miami, FL Upper Air Station
MWP	Meteorologist Weather Processor
NA	North American
NEXRAD	Next Generation Weather Radar
NIDS	NEXRAD Information Dissemination Service
NLDN	National Lightning Detection Network
NMC	National Meteorological Center
NWS	National Weather Service
OCT	Operational Capabilities Test
OT&E	Operational Test & Evaluation
RFP	Request For Proposal
SAT	Site Acceptance Test
SHV	Shreveport, LA
SMP	Station Model Plot
TET	Technical Evaluation Team
TOT	Technical Operations Team
TP	Echo Tops
VAD	Velocity Azimuth Display Winds
VIS	IA Visible
WARP	Weather and Radar Processor
WSR-88D	Weather Surveillance Radar - 1988 Doppler
ZFW	Dallas/Fort Worth, TX

**APPENDIX A**  
**Operational Capabilities Test Areas Requirements Scoring**



The table below presents the OCT requirements scoring. An "X" in the "Passed" column indicates the requirement was verified successfully during OCT conduct. An entry in the "Failed" column indicates that the requirement was not successfully verified during the OCT. There are three descriptors that are used in the "Failed" column. An "X" is used to indicate that the requirement failed during the OCT. The descriptor "NP" is used to indicate that the requirement was not verified during the OCT because a particular test or portions of a test was not performed. The descriptor "FA" is used to indicate that the requirement failed due to data analysis.

#### Priority 1 Requirements

Paragraph #	Test Number 1 - Radar	Passed	Failed
3.2.1.1.1.1.1.1	ACF area	X	
3.2.1.1.1.1.1.1.1	Area of coverage	X	
3.2.1.1.1.1.1.2	National Mosaic	X	
3.2.1.1.2.1.1.1.1	ACF mosaics	X	
3.2.1.1.2.1.1.1.1.1	Mosaic update	X	
3.2.1.1.2.1.1.1.1.2	Multiple coverage	X	
3.2.1.1.2.1.1.1.1.5	Resolution	X	
3.2.1.1.2.1.1.1.2	National mosaic	X	
3.2.1.1.2.1.1.1.3(b)	WSR-88D product resolution	X	
3.2.1.1.2.1.1.1.3(I)	Color assignment	X	
3.2.1.1.2.1.1.1.3(k)	National mosaic 6 VIP levels	X	
3.2.1.1.2.1.1.1.3(l)	ACF mosaic 6 VIP levels	X	
3.2.1.1.4.1.1.1	Product reception log	X	
3.2.1.1.4.1.2(c)	Log requests	X	
Appendix C Table 30-1	Product Acquisition Performance	X	
Paragraph #	Test Number 2 - Satellite	Passed	Failed
3.2.1.1.2.1.1.2.1	Areas of coverage		X
3.2.1.1.2.1.1.2.2(a)	Radiometric resolution	X	
3.2.1.1.2.1.1.2.2(d)	Image enhancement	X	
3.2.1.1.2.1.1.2.2(e)	User-specified enhancement	X	
3.2.1.1.2.1.1.2.2(f)	Enhancement curve storage and retrieval	X	
3.2.1.1.4.1.1.1	Product Reception log	X	
3.2.1.1.4.1.2(c)	Log requests	X	
Appendix C Table 30-1	Product acquisition performance	X	
Paragraph #	Test Number 4 - Received Alphanumeric Products	Passed	Failed
3.2.1.1.1.1.4	Alphanumeric products	X	
3.2.1.1.1.1.4.1	Areas of coverage	X	
3.2.1.1.2.1.2.1	Display products		FA
3.2.1.1.2.1.2.2	Coverage area selection	X	

3.2.1.1.4.1.1.1	Product Reception log	X	
3.2.1.1.4.1.2(c)	Log requests	X	
Appendix C Table 30-1	Product acquisition performance	X	
<b>Paragraph #</b>	<b>Test Number 14 - Computer-Human-Interface (CHI)</b>	<b>Passed</b>	<b>Failed</b>
3.2.1.1.2.1.2.4	Manually generated alpha products	X	
3.2.1.1.2.1.3.10	Manually generated graphics	X	
3.2.1.1.2.2.1	Products	X	
3.2.1.1.2.2.2	Automatic update	X	
3.2.1.1.2.2.3.2	Screen and window control	X	
3.2.1.1.2.2.4.1	Projections	X	
3.2.1.1.2.2.5	Overlays	X	
3.2.1.1.2.2.5.2	Product removal	X	
3.2.1.1.2.2.6	Zoom	X	
3.2.1.1.2.2.6.1	Images	X	
3.2.1.1.2.2.6.2	Graphics	X	
3.2.1.1.2.2.6.3	Legends	X	
3.2.1.1.2.2.7	Pan	X	
3.2.1.1.2.2.8	Animation	X	
3.2.1.1.2.2.11	Color	X	
3.2.1.1.2.2.14.1	Alphanumeric	X	
3.2.1.1.2.2.14.2	Image and graphics	X	
3.2.1.1.2.2.15.1.1	Text processing	X	
3.2.1.1.2.2.15.1.2	Graphic processing	X	
3.2.1.1.2.2.15.1.3	Legends	X	
3.2.1.1.2.2.15.1.4	Storage	X	
3.2.1.1.2.2.16	Product display request	X	
3.2.1.1.2.2.16.1.1	Routine individual radar products	X	
3.2.1.1.2.2.16.1.3.1	Mosaic product request	X	
3.2.1.1.2.2.16.2.1(a)	Product ID	X	
3.2.1.1.2.2.16.2.1(b)	Station/collective ID	X	
3.2.1.1.2.2.16.2.1(c)	Time	X	
3.2.1.1.2.2.16.2.1(d)	Version #	X	
3.2.1.1.2.2.16.2.1(e)	Product type	X	
3.2.1.1.2.2.16.2.2	Collectives	X	
3.2.1.1.2.2.16.2.3	Alphanumeric display	X	
3.2.1.1.2.2.16.3.1	Graphic product request	X	
3.2.1.1.2.2.16.4	Retained product directory	X	
3.3.7.2	User interface requirements		X
3.2.1.1.2.3.1	Individual product request	X	
3.2.1.1.2.3.2	Automatic update	X	

3.2.1.1.2.3.3.1	Display area	X	
3.2.1.1.2.3.3.2	Screen and window control	X	
3.2.1.1.2.3.4	Retained product directory	X	
3.2.1.1.2.3.5	Display backgrounds	X	
3.2.1.1.2.3.6	Overlay and projections	X	
3.2.1.1.2.3.8	Zoom	X	
3.2.1.1.2.3.9	Pan	X	
3.2.1.1.2.3.11	Product sequencing	X	
3.2.1.1.2.3.12	Color	X	
3.2.1.1.2.3.13	Color hardcopy	X	
<b>Paragraph #</b>	<b>Test Number 17 - WARP Performance Processing</b>	<b>Passed</b>	<b>Failed</b>
Table 30-1	WSR-88D acquisition	X	
Table 30-1	Satellite product acquisition	X	
Table 30-1	Alphanumeric product acquisition	X	
Table 30-1	Gridded product acquisition	X	
Table 30-1	Graphic product acquisition	X	

### Priority Two Requirements

Paragraph #	Test Number 3 - Lightning	Passed	Failed
3.2.1.1.1.1.3	Lightning products	X	
3.2.1.1.1.1.3.1	Areas of coverage	X	
3.2.1.1.2.1.3.2.1	National lightning product	X	
3.2.1.1.2.1.3.2.3(a)	Age of each stroke	X	
3.2.1.1.2.1.3.2.3(b)	Polarity of each stroke	X	
3.2.1.1.2.1.3.2.3(c)	Latitude/longitude location	X	
3.2.1.1.2.1.3.2.3(d)	Warp system projection	X	
3.2.1.1.2.1.3.2.3(g)	Product display areal extent	X	
3.2.1.1.2.1.3.2.4	Coverage area selection	X	
3.2.1.1.4.1.1.1	Product reception log	X	
3.2.1.1.4.1.2	Log requests	X	
Appendix C, Table 30-1	Product acquisition performance requirements	X	
Paragraph #	Test Number 4 - Received Alphanumeric Products	Passed	Failed
3.2.1.1.2.1.2.3(a)	Request product and associated corrections	X	
Paragraph #	Test Number 5 - NWS Graphic Products	Passed	Failed
3.2.1.1.1.1.6	Graphic products	X	
3.2.1.1.2.1.3.1	NWS graphic products	X	
3.2.1.1.4.1.1.1	Product Reception log	X	
3.2.1.1.4.1.2(c)	Log requests	X	
Paragraph #	Test Number 9 - Contour Analysis Products	Passed	Failed
3.2.1.1.1.1.5	Gridded products	X	
3.2.1.1.1.1.5.1	Areas of coverage	X	
3.2.1.1.2.1.3.7	Contour analyses	X	
3.2.1.1.2.1.3.7.1	Parameter selection	X	
3.2.1.1.2.1.3.7.1(a)(1)	Parameter selection- unevenly spaced data, surface data	X	
3.2.1.1.2.1.3.7.1(a)(2)	Parameter selection- unevenly spaced data, upper air data	X	
3.2.1.1.2.1.3.7.1(b)(1)	Parameter selection - evenly spaced data, 1000 mb	X	
3.2.1.1.2.1.3.7.1(b)(2)	Parameter selection- evenly spaced data, upper air	X	
3.2.1.1.2.1.3.7.2	Coverage area selection	X	
3.2.1.1.2.1.3.7.3	Pressure level and time selection	X	
3.2.1.1.2.1.3.7.4	NMC forecast model selection	X	
3.2.1.1.2.1.3.7.5	Display characteristics	X	
3.2.1.1.2.1.3.7.5(a)	Clearly labeled contours		FA
3.2.1.1.2.1.3.7.5(b)	Max, min special characters	X	
3.2.1.1.2.1.3.7.5(c)	Display smooth curved contours	X	
3.2.1.1.2.1.3.7.5(d)	Projection	X	
3.2.1.1.2.1.3.7.5(e)	Display full areal extent	X	

<b>Paragraph #</b>	<b>Test Number 15 - WARP Retention</b>	<b>Passed</b>	<b>Failed</b>
3.2.1.1.4.2	Retention		X
3.2.1.1.2.2.15.4	Retained Product Directory	X	
<b>Paragraph #</b>	<b>Test Number 16 - Warp Archiving</b>	<b>Passed</b>	<b>Failed</b>
3.2.1.1.4.3.1	Products and logs	X	
3.2.1.1.4.3.1.1	System logs	X	
3.2.1.1.4.3.1.2	Generated products		X
3.2.1.1.4.3.3	Archive storage	X	
3.2.1.1.4.3.2	Archival Requests		X
<b>Paragraph #</b>	<b>Test Number 17 - WARP Performance Processing</b>	<b>Passed</b>	<b>Failed</b>
3.2.1.1.2.4	Performance	X	
Appendix C		X	
Table 30-1	Lightning product acquisition	X	
Table 30-2	Lightning product generation	X	
Table 30-2	NWS graphic product generation	X	
Table 30-2	Station model plot generation	X	
Table 30-2	Thermodynamic analyses	X	
Table 30-2	W/W/A product plot generation	X	
Table 30-2	Other graphic product generation	X	
Table 30-3	Display non-image product	X	
Table 30-3	Display image product	X	
<b>Paragraph #</b>	<b>Test Number 18 - WARP Adaptive Operation</b>	<b>Passed</b>	<b>Failed</b>
Appendix D	WARP adaptation requirements	X	
<b>Paragraph #</b>	<b>Test Number 19 - WARP System Characteristics</b>	<b>Passed</b>	<b>Failed</b>
3.2.4.2.1	Workstation display console		X
3.2.4.2.1.1	ACF WARP workstation display console		X
3.2.4.2.2	Briefing terminals	X	
3.2.4.2.3	Color hardcopy device	X	
3.2.4.2.4	Alphanumeric printer	X	
3.3.7.3	Display equipment	X	

### Priority Three Requirements

Paragraph #	Test Number 1 - Radar	Passed	Failed
3.2.1.1.2.1.1.1.0	Point products	X	
3.2.1.1.2.1.1.1.3(d)	ACF mosaic Projection	X	
3.2.1.1.2.1.1.1.3(e)	National mosaic projection	X	
3.2.1.1.2.1.1.1.3(g)	WSR-88D product projection	X	
3.2.1.1.2.1.1.1.3(h)	Display full areal extent	X	
Paragraph #	Test Number 2 - Satellite	Passed	Failed
3.2.1.1.2.1.1.2.2(b)	Projections	X	
3.2.1.1.2.1.1.2.2(c)	Product display	X	
3.2.1.1.2.1.1.2.2(g)	Display updates	X	
Paragraph #	Test Number 6 - Watch, Warning, Advisory Products	Passed	Failed
3.2.1.1.2.1.3.3	Watch, warning, and advisory (W/W/A) products		NP
3.2.1.1.2.1.3.3.1	Coverage area selection		NP
3.2.1.1.2.1.3.3.2(a)	Projection		NP
3.2.1.1.2.1.3.3.2(c)	Display full areal extent		NP
3.2.1.1.2.1.3.3.2(d)	Unique ID		NP
3.2.1.1.2.1.3.3.2(f)	Polygon overlap delineation		NP
Paragraph #	Test Number 7 - Plot Products	Passed	Failed
3.2.1.1.2.1.3.4(a) (1)	Plots- surface observations	X	
3.2.1.1.2.1.3.4(a) (2)	Plots- upper air observations	X	
3.2.1.1.2.1.3.4.1	Coverage area selection	X	
3.2.1.1.2.1.3.4.2	Pressure level and time selection	X	
3.2.1.1.2.1.3.4.3	Parameter selection	X	
3.2.1.1.2.1.3.4.4(a)	Discernible parameters	X	
3.2.1.1.2.1.3.4.4(b)	Automatic declutter	X	
3.2.1.1.2.1.3.4.4(c)	Projection	X	
3.2.1.1.2.1.3.4.4(d)	WMO codes	X	
3.2.1.1.2.1.3.4.4(f)	Display full areal extent	X	
3.2.1.1.2.1.3.4.4(g)	Wind direction and speed	X	
Paragraph #	Test Number 8 - Thermodynamic Products	Passed	Failed
3.2.1.1.2.1.3.5	Thermodynamic product	X	NP <sup>1</sup>
3.2.1.1.2.1.3.5.1	Derived thermodynamic values	X	
3.2.1.1.2.1.3.5.2	Location selection	X	
3.2.1.1.2.1.3.5.3(a)	Plot on thermo diagram	X	
3.2.1.1.2.1.3.5.3(b)	Temperature line segments	X	
3.2.1.1.2.1.3.5.3(c)	Dew point temp line segments	X	

<sup>1</sup> For NMC Gridded products only.

3.2.1.1.2.1.3.5.3(d)	Wind speed wind barb font	X	
3.2.1.1.2.1.3.5.3(e)	Wind direction wind barb font	X	
3.2.1.1.2.1.3.5.3(f)	Pressure heights to left	X	
3.2.1.1.2.1.3.5.3(g)	Derived thermo values not obscure display	X	
3.2.1.1.2.1.3.5.3(h)	Display full extent of diagram	X	
<b>Paragraph #</b>	<b>Test Number 10 - Streamline Analysis Products</b>	<b>Passed</b>	<b>Failed</b>
3.2.1.1.1.1.5	Gridded products	X	
3.2.1.1.1.1.5.1	Areas of coverage	X	
3.2.1.1.2.1.3.8	Streamline analyses	X	
3.2.1.1.2.1.3.8.1	Coverage area selection	X	
3.2.1.1.2.1.3.8.2	Pressure level and time selection	X	
3.2.1.1.2.1.3.8.3	NMC forecast model selection	X	
3.2.1.1.2.1.3.8.4(a)	Display isotachs w/values	X	
3.2.1.1.2.1.3.8.4(b)	Max, min special characters	X	
3.2.1.1.2.1.3.8.4(c)	Direction of flow arrowheads	X	
3.2.1.1.2.1.3.8.4(d)	Projection	X	
3.2.1.1.2.1.3.8.4(e)	Display full areal extent	X	
<b>Paragraph #</b>	<b>Test Number 11 - Vertical Cross-Section Analysis Products</b>	<b>Passed</b>	<b>Failed</b>
3.2.1.1.1.1.5	Gridded products		X
3.2.1.1.1.1.5.1	Areas of coverage		X
3.2.1.1.2.1.3.9	Vertical cross-section analyses	X	
3.2.1.1.2.1.3.9.1	Evenly spaced data (gridded)		X
3.2.1.1.2.1.3.9.2(a)	Unevenly spaced data - observed	X	
3.2.1.1.2.1.3.9.2(b)	Unevenly spaced data - derived	X	
3.2.1.1.2.1.3.9.3	Coverage area selection	X	
3.2.1.1.2.1.3.9.4(a)	Clearly label contours	X	
3.2.1.1.2.1.3.9.4(b)	Max, min special characters	X	
3.2.1.1.2.1.3.9.4(c)	Station/location relative positions	X	
3.2.1.1.2.1.3.9.4(d)	Display full areal extent	X	
3.2.1.1.2.1.3.9.4(e)	Display smooth curved contours	X	
<b>Paragraph #</b>	<b>Test 12 - Alarm/Alert</b>	<b>Passed</b>	<b>Failed</b>
3.2.1.1.3.1	Meteorologist workstation alarm/alert notification requirements	X	
3.2.1.1.3.1.1	Product alarm/alert	X	
3.2.1.1.3.1.2	Weather alarm/alert	X	
3.2.1.1.3.3	Audible and visual characteristics	X	
3.2.1.1.3.3.1(a)	Enable/disable alarm/alert	X	
3.2.1.1.3.3.1(b)	Define valid time	X	
3.2.1.1.3.3.1(e)	Acknowledgment of alarms	X	

Paragraph #	Test 13 - WARP Monitoring and Control	Passed	Failed
3.2.1.1.3.1.3	System alarm/alert		X
3.2.1.1.5.1.1	Processing	X	
3.2.1.1.5.2.1	System start-up/re-start	X	
3.2.1.1.5.2.1.1	Transition to operational	X	
3.2.1.1.5.2.2	System shutdown	X	
3.2.1.1.5.2.2.1	Shutdown processing	X	
3.2.1.1.5.2.3	System security	X	
3.2.1.1.5.2.3(a)	Password verification	X	
3.2.1.1.5.2.3(b)	Password control	X	
3.2.1.1.5.2.3(e)	Unauthorized access log	X	
3.2.1.1.5.2.3(f)	Add/remove users	X	
3.2.1.1.5.2.4(a)	Write files	X	
3.2.1.1.5.2.4(b)	Read files		X
3.2.1.1.5.2.4(c)	Move files	X	
3.2.1.1.5.2.4(e)	Control off-line storage	X	
3.2.1.1.5.2.4(f)	Display/print archived files	X	
3.2.1.1.5.2.4(g)	Create/rename files/directories	X	
Paragraph #	Test Number 14 - Computer-Human-Interface (CHI)	Passed	Failed
3.2.1.1.2.1.3.10.1(a)	Discernible parameters	X	
3.2.1.1.2.1.3.10.1(b)	Projection	X	
3.2.1.1.2.1.3.10.1(c)	Display full areal extent	X	
3.2.1.1.2.2.2.1	Automatic update selection	X	
3.2.1.1.2.2.3.1	Display area	X	
3.2.1.1.2.2.4	Display backgrounds(a-d)	X	
3.2.1.1.2.2.5.1	Legends	X	
3.2.1.1.2.2.5.3	Overlay precedence	X	
3.2.1.1.2.2.9	Combined capabilities	X	
3.2.1.1.2.2.10	Product sequencing	X	
3.2.1.1.2.2.16.2.1(f)	City/state	X	
3.2.1.1.2.2.17	Legends (a-e)	X	
3.2.1.1.2.3.7	Legends	X	